Literature.

Geology, Introductive, Descriptive, and Practical. By DAVID THOMAS ANSTED, M.A., F.R.S., &c.—London: Van Voorst, Paternoster-row, 1844.

THE two elegant volumes now before us are highly complimentary to the learning and research of Mr. Ansted, and to the taste and spirit of the publisher, Van Voorst. With the high commendation of being comparatively free from the mysticisms of the science of Geology, they elicit our warm commendation for the methodical simplicity of arrangement and judicious selection of pleasing and important information brought down to the present period.

One century ago, geology, according to the definition given by Mr. Ansted, was unknown; the earth was never previously explored, unless for practical purposes, and when the organic phenomena of its strata first arrested the attention of men of science, the explanations given by them were conformable to the age in which they lived, crude, contradictory, and oft-times ridiculous. But this twilight of observation, however unsatisfactory to the mind thirsting after knowledge, was the infancy of geology, which, struggling into existence through almost insurmountable difficulties, soon made itself a name, increasing in beauty and utility, in wisdom as in years.

Mr. Ansted has most decidedly given the world the most pleasing, if not the most useful exposition of the science of geology of the present day; and, while we differ somewhat from him in the relative position and importance of mineralogy and chemistry; we can scarcely blame him, on observing that his object evidently is to render geology more extensively and practically useful, and by disrobing it of its strange and somewhat forbidding technicalities, to invite the young aspirant to scientific honours, to follow in the path of observation pointed out, that he may in turn be enabled to contribute his quota to the existing fund of human knowledge.

In considering geology in connection with architecture, Mr. Ansted informs the architect, that "the object of geology is to observe and describe the internal crust of the globe; and from the consideration of the phenomena there presented to view, to trace the successive changes that have taken place upon the earth, and the various laws or modes of action employed in effecting these changes." That it is absolutely essential to the architect and engineer to have some degree of knowledge thus defined as belonging to the department of geology cannot be questioned, for to readily comprehend what difficulties are likely to arise and what dangers are to be avoided, in forming roads, canals, railways, viaducts, and aqueducts, in building bridges or houses, is to enable ourselves the better to meet the one and overcome the other.

In introducing his readers to the technical expressions of geology, Mr. Ansted observes that "a very slight knowledge of mineralogy is sufficient to acquire geological knowledge," and that under this term "it is usual to designate all those substances which occur in masses, and which lie beneath the vegetable soil, by the general term *rocks*; and in this sense, clay and sand are called rock by the geologist, as well as granite and limestone." For all practical purposes this explanation should ever be borne in mind by the architect, otherwise, under this general term he must very often inevitably be led astray.

The Romans, not content with a climate favourable to the preservation of stone, carefully collected the results of experience, and placed them on record, for the benefit of future generations. In the writings of Vitruvius on Roman architecture, the most particular rules were laid down with respect to the selection and use of building stones and the cements employed by them; and every country then known to or under the rule of this warlike nation contributed the choice produce of its quarries for the advancement and grandeur of the great capital of the world. This desire of the ancients for building with durable materials ought to be fully participated in by modern architects, who, as part of their profession, should be enabled to classify and arrange building-stones, to apply, when required, the rules of chemical analysis, in order to discover their composition, physical character, and powers of endurance of heat and moisture. As Mr. Ansted observes, it is the duty of the engineer to obtain a correct knowledge of the line of country through which he is to conduct roads, railways, canals, tunnellings, and embankments, and to do this effectually, he must have some knowledge of the leading principles of geology, as also of mineralogy, to which the former science is so strictly allied; still the engineer, in thus seeking aid from geology, must bear in mind that practical information is all he requires; to speculate on possibilities, and thereby involve large additional expenditure, is dangerous in the extreme. Geology, therefore, while, on the one hand, it commands his attention, and forms a part of his study, should, on the other, be carefully applied practically, lest it lead him into difficulties.

Mr. Ansted suggests the necessity of rigid attention to a system of drainage, in order to guard against landslips. That many evils have arisen from not taking proper precautions in this respect, is too true; but in behalf of the engineer, it is right to add that circumstances very often place these matters entirely beyond his control; for it often happens that the lands through which long cuttings are made, are of such a nature as to involve with the question of drainage that of vast expense; and this land seldom belongs to, or is under the control of the purchasers of the direct track in which the cutting is made, who have not power by Act of Parliament, or otherwise, to compel the proprietor to use Watson's draining pipes. Again, as practical men, it may be as well to observe that landslips as often occur in horizontal as in vertical strata; for there is always a tendency in clay beds, having great absorbing powers, to separate when saturated with moisture, or, on the evaporation of that moisture during the summer months, to contract in their parts, open into chasms, and either separate directly, or the seeds of separation would be sown against the rains commenced.

The observations of Mr. Ansted on the necessary attention of engineers to tunnelling are also good; but here, again, the geological engineer would be deservedly brought to book, if in conformity with Mr. Ansted's views, from mere suspicion, of hills of a particular shape having a nucleus of igneous rock, he should deviate from the direct line, and thereby interfere with the contract, and check the progress of the undertaking.

In the construction of harbours, breakwaters, quays, and bridges, a geological course of studies would greatly benefit the engineer, by enabling him to form a sounder judgment on the material to be employed, from whence it is to be procured, and of the beds on which the superstructure is to be raised. This Mr. Ansted recommends attaining by an attentive examination of the neighbouring rocks and quarries; and quotes the opinion of Sir H. De la Beche, who remarks, that "an observer may often obtain information on this head by studying the condition of the rocks on the banks and sea-shores." The valuable profile of the railways of the United Kingdom, first suggested by the geological section of the British Association, and now deposited in the Museum of Economic Geology, will long remain a monument of British engineering skill, and a proud triumph over apparently insurmountable difficulties.

"In architecture," says Mr. Ansted, "as in all kinds of engineering works, the benefit derived from a knowledge of geological science is shewn, not only with respect to the foundation of the building, but also in the selection of its site and of the materials of which the superstructure is composed. In the case at present before us this benefit is chiefly obtained in the selection of building materials, but it also has reference to the other parts of the subject, for there can be no doubt that the foundations of all buildings, more especially of those which are intended to last for centuries, should be most carefully selected, so as to possess the advantage of thorough drainage, and be unaffected by any changes that may take place on the surface by the action of ordinary causes."

Unfortunately for architects, they have seldom or never the choice of site left to them, their duty being to give plans for a building to be erected upon a *chosen* spot, and of necessity in prosecuting the work to provide for the imperfections and casualties as they think proper. Here they are necessitated to fall upon artificial contrivances for draining and securing the foundations, for excluding the wet.

In entering upon the subject of building material, Mr. Ansted relates an anecdote of a practical man who had been employed in selecting stone for an important public building about to be erected, that in looking out for good stone, he was accustomed to go to the churchyard in the neighbourhood of the quarries he wished to judge of, and examine on all sides the oldest tomb-stones that were there.*

"A stone," says Mr. Ansted, "which resists exposure to the air, may be readily disintegrated by water; and on the other hand, a porous sandy rock will resist the action of water, but fall to pieces when exposed to frost and atmospheric changes. Many kinds of stone are sufficiently durable for sheltered situations, but crumble away when more exposed; others are durable in the country, becoming covered with lichens, which preserve them from atmospheric action, but are disintegrated in towns, where the covering of soot they soon obtain may assist in destroying their surface, and opening the way to a more mischievous, because a deeper-seated action."†

The following quotations, though now old, cannot fail to interest some of the readers of THE BUILDER; they are principally drawn from the report of the committee appointed to select the stone for the Houses of Parliament.

"LIMESTONES.

"Of limestones," says Mr. Ansted, "there are two or three distinct kinds, each of which is worthy of notice with respect to its geological position, as well as its economic value. The first of these includes the argillaceous limestone, common in silurian rocks, and found also in Devonshire and Cornwall (in rocks of the Devonian period); but stone of this kind is not confined to any particular localities, being met with also in the cretaceous series.

"The second and most important group of limestones for building purposes comprises those (chiefly of the mountain limestone series) which are crystalline and compact, and often of a blue colour. The third series includes the oolites (which are the stones most commonly used, and the most convenient for ordinary purposes), abounding in the middle secondary groups of formations, and employed in most of the public buildings that have been erected in the middle, west, and south of England. These stones, however, vary greatly in relative value as building materials."

"The argillaceous limestones of the older rocks are so rarely of sufficient durability to be used for public buildings, that there is no quarry reported on by the commissioners, one excepted, an accidental variety of the lower chalk quarried at Totternhoe, near Dunstable, and formerly used in some kinds of external work, but now superseded by Bath stone; like other kinds of *clunch*, this bed forms an easily cut, and a very useful material for certain kinds of internal decorative work, and has often been used for such purposes in the interior of our cathedrals. The crystalline carbonates of lime that have been used for building are not very numerous, although they possess many advantages, among which great durability and resistance to decomposition may be ranked as the principal. Many of them, however, are too expensive to be generally employed, such as marble and ornamental stones, and the number of fossil remains found in those of Derbyshire and Devonshire sometimes tends to diminish their value, by exposing them to unequal decomposition in the parts where fossils chiefly abound."

"It is chiefly the oolite limestones that have been employed in England for building purposes; they are so called from the egg shaped particles being cemented together by a calcareous matter of varied character: they will of necessity suffer unequal decomposition unless the oviform bodies and the cement be equally coherent and of similar composition. Of those

* [There is a remarkable instance in Hornsey church-yard of a flat ledger of Purbeck stone (which is hard to work) placed over a bricked grave some half century ago, which has strewn the surrounding site with its splitting and dissolving fragments.—ED.]

† [We do not find soot of itself injurious to the durability of stone, but, on the contrary, believe where it is not washed away the tool-marks generally remain.—ED.]

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